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GROUND WATER RESOURCES AND THEIR CONSERVATION

GROUND WATER PROVINCES OF THE UNITED STATES (Continued)

Provinces P, Q, and R

P—Southern Rocky Mountain Province,
Q—Montana-Arizona Plateau Province,
R—Northern Rocky Mountain Province.

These three provinces roughly occupy the Rocky Mountain area from the Canadian border to the central part of Arizona and the northwestern corner of New Mexico. As a whole the area is noted for its lack of ground water. There are places, however, where ground water is available, though the generally rocky nature of the surface formations prevents any similarity of ground water conditions from place to place.

Province P in the central part of Colorado and part of Wyoming is a high mountainous area underlain by hard crystalline rocks and such water supplies as there are, are mostly from springs, mountain streams, and shallow wells near the streams.

In Province Q which extends through parts of Colorado, Utah, Wyoming and Montana, the conditions for underground water are more favorable. In fact, there is an area in southeastern Utah and southwestern Colorado which forms an upland region lying from 5,000 to 6,000 feet above sea level which has some ground water available. The region which is known as the Colorado Plateau is drained by the Colorado River and its tributaries through deep canyons.

Wherever there is farming land, the river valleys were settled years ago, mostly by Mormons from Utah. There is extensive ditch irrigation wherever practicable. The rock formations consist mostly of sandstone and shale ranging from Carboniferous to Tertiary in age. In some formations, such as the Mancos shale of Cretaceous age, the water is highly mineralized. Water of better quality is obtained from the Mesa Verde formation. Where the Dakota sandstone is present and can be reached by wells, good water is usually found. This formation and others associated with it cover much of southwestern Colorado. In southeastern Utah the surface rocks are older than the Dakota sandstone, with fair supplies being obtained from sandy beds of Jurassic and Triassic age. The water from Carboniferous rocks is usually highly mineralized with salt, gypsum, or limestone.

Within this region in southeastern Utah there are several artesian areas. One of them in the San Juan River valley near Bluff furnished water for several artesian wells. North of Blanding artesian conditions were found but the head was not sufficient to cause the wells to flow at the surface. Several other valleys, such as Dry Valley and Spanish Valley, are geologically located so as to have good possibilities for artesian water.

A few miles southwest of Moab there is a syncline crossed by the Colorado River. In the canyon of the river the base of the Navajo sandstone and upper beds of the Kayeita formation are exposed. It is possible that flowing artesian water could be reached in the Wingate sandstone by wells approximately 1,000 feet deep drilled near the axis of the syncline.

The Courthouse syncline is a continuation of the folding seen in Spanish and Moab valleys. A well six miles south of Valley Junction probably would encounter Dakota

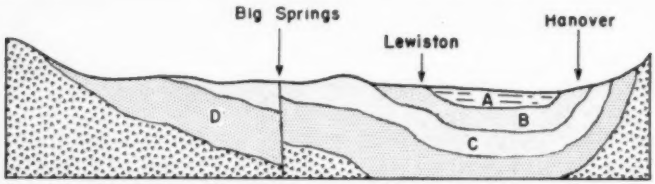
(Continued on Page 2)

We hope our customers have in mind the fact that critical materials like steel, copper, etc., are in short supply and will be for some time to come.

Manufacturers using these materials must make application for them from the Water Resources Division of NPA. Naturally this agency judges a manufacturer's application by the amount of material he requires for orders carrying a priority rating.

Drillers can help us by supplying a priority rating whenever possible. These ratings are available for any job requiring critical materials and your customer should be asked to furnish them to you. You then certify your orders to us accordingly.

SEE PAGE 9 FOR FURTHER IMPORTANT DETAILS.



A - Colorado Shale, B - Kootenai, C - Ellis, D - Quadrant

Generalized northwest-southeast cross-section at Lewiston, Montana (M. C. No. 2).

GROUND WATER PROVINCES OF THE UNITED STATES

(Continued from Page 1)

sandstone if drilled deep enough. Near Green River an oil test well encountered water under artesian head at 500 feet, in the Morrison formation. This well yielded brackish water for several years. Other synclines in this area show the same possibilities as far as ground water is concerned but there is no general availability of ground water.

In most of the portion of southwestern Colorado that is covered by Dakota sandstone the structural folding is gentle and in the Dry Creek basin the sandstone dips steeply into the basin. It has been estimated by geologists that artesian water should be found at depths of 1,000 feet or more. In some parts of southwestern Colorado the geology is such that water under pressure has been found in drilled wells under sufficient pressure to rise in the drill hole but not enough to flow at the surface. In the extreme southwestern part of Colorado the Mancos shale and Mesa Verde formation cover the Dakota sandstone and older formations. A few deep wells drilled in the area have found water under pressure. The most notable is a well drilled at the Mesa Verde National Park post office to the Navajo sandstone. The well is over 4,000 feet deep with water rising to within 1,200 feet of the surface. Several stock water wells drilled by the United States Indian Service have struck water in the Dakota sandstone at shallower depths.

In northern Arizona there is an area in the Colorado Plateau Province (Q) of folded sedimentary rocks traversed by many canyons. It includes parts of Coconino, Navajo and Apache Counties and is known as the Holbrook Region. It is primarily a grazing country and one of the problems is to find water for the stock that can be fed on the range. Every device known has been tried to secure and maintain any kind of a water supply.

Due to the fact that the rocks of the region include both consolidated and unconsolidated sedimentary formations, considerable time has been spent investigating underground water. The sedimentary rocks exposed at the surface range from Permian to Recent in age, but the sequence is broken by many unconformities. The permeable rocks in the region are great natural reservoirs that store the water from rain and snow that percolates into them.

The deepest water-bearing formation is the Red wall limestone which contains salty water. Above this formation and separated from it by unconformities is the Coconino sandstone. This formation is an excellent water bearer and in places the water is under artesian pressure, though down the dip from the outcrop it may be salty.

The next higher formation is the Kaibab limestone which is not considered as an aquifer. This formation is overlain by the Moenkapi shales and sandstones. It contains water of poor quality and limited supply. It is not important as an aquifer. Passing through the Shinarump conglomerate and the Chinle formation which are not good aquifers we come to the Wingate sandstone and the Morrison formation. Neither of these formations contain water of importance.

The next higher geologic system is the Cretaceous. Only upper Cretaceous rocks have been recognized in the Holbrook region but these are the source of ground water as they underlie most of the southeastern part of the region. Records of wells drilled indicate that yellow sandstones are found at depths of 200 to 700 feet which probably are Cretaceous. Near the state line of New Mexico several wells produce good water from this formation.

Probably the best source of ground water is the formations of the Tertiary system. These cover large parts of the area in Apache County and occur in the form of low, rolling sandy hills formed by deposits of sand and gravel. These deposits are 200 feet thick in places and are made up of light colored fine grained quartz sand, with lenses of conglomerate or soft sandstone and thin beds of shale. The outcrop area of these sands acts as a collecting basin for surface waters, but these unconsolidated deposits are so porous that much of the water that enters them sinks downward to the less permeable formations lying below. The water from the lower portion of these sand deposits is of good quality.

Another source of ground water is the high level gravel and Travertine deposits of the Quaternary and Tertiary systems. The high level gravels are found at altitudes of 6,500 to 7,000 feet in an area of relatively high precipitation. The Travertine deposits which are calcareous in nature are the result

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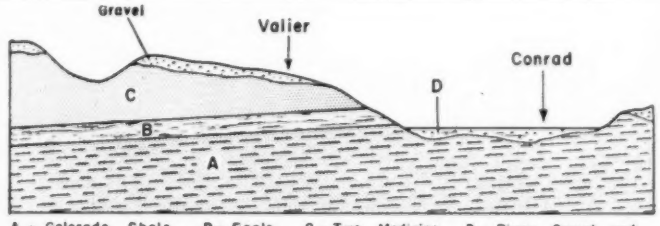
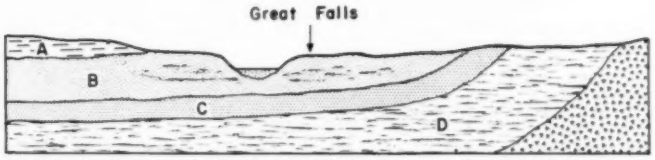


A - Colorado Shale, B - Eagle, C - Two Medicine, D - River Gravel and Drift

Generalized east-west cross-section at Valier, Montana (M. C. 2).



Generalized north-south cross-section through Great Falls, Montana (M. C. 2)

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of hot spring activity. They are found as cones topping the sedimentary hills. At the top of one of the Twin Buttes a narrow, irregular opening can be followed downward a hundred feet or more. Springs of warm highly mineralized water are found near the base of one of the buttes and several similar springs all depositing travertine are found in the Little Colorado River valley. The warm temperature of the water may be due to contact with heated igneous rocks at greater depth. The source of the lime and other minerals in the travertine deposits is not definitely known but it is probably some one of the underlying formations.

The sedimentary formations of Quaternary age in the Holbrook region of Arizona consist of alluvial deposits in the stream valleys and a few terrace and wind-blown deposits. The deposits are made up of poorly sorted sand, gravel, and silt and range from a few feet up to one hundred feet in thickness. The deposits are noticeable along Cottonwood Creek, the Rio Puerco, Carrizo, Milky and Leroux Washes, the Little Colorado, Zuni and Dead Rivers.

Where these deposits occur, they usually contain abundant supplies of water at shallow depths. The water, however, may be high in dissolved minerals and hence unfit for domestic purposes.

Still another source of water in the Holbrook region is the igneous rocks of the Quaternary and Tertiary systems. These rocks crop out in many places as isolated masses which have been extruded due to geologic action. They consist of basaltic lavas and cinder deposits and are rather extensive in area. The lava flows locally known as "malpais" are of porous cellular texture. Most of the outcrops of volcanic rocks occur in areas of high precipitation and therefore are catchment basins for water. The water drains through these beds rapidly and only a few wells drilled in them have proved successful. Usually the contact of the lava beds with underlying rocks is a good place for water and many springs derive their water from these contacts.

A large part of the water used in the Holbrook region comes from wells and springs in spite of the fact that only a small part of the annual precipitation ever reaches the underlying porous rocks. Many ponds and reservoirs have been constructed in the region to conserve all the water possible. The distribution of such wells as have been drilled is spotted with most of them along railroads or near the villages and towns. Such aquifers as the Coconino or Cretaceous sandstones appear to hold the most possibilities as sources of ground water.

Farther north in Province Q there are places that have been studied from the standpoint of ground water. The studies were made either from the standpoint of local needs for water or in connection with the ground water studies made for proposed developments in the Missouri River basin. One of these studies was made of the Laramie Basin in south-Central Wyoming. The area covered included the Laramie River Basin from its upper end to the Wheatland Reservoir. The area is bordered on the north and east by the Laramie Range, on the south by the Front Range, and on the west by the Medicine Bow Range. It is open to the northwest. The plain floor ranges in altitude from 7,000 to 7,500 feet and consists of broad, shallow terraced valleys, separated by low flat terraces of older origin.

The sedimentary rocks exposed in the basin range in age from Mississippian to Recent. The chief sources of ground water are the alluvium deposits found along the main streams and the terrace deposits above the streams. The underlying formations mostly shales and sandstones have possibilities but they have not been thoroughly explored. The water table in the shallow deposits ranges from a few feet below the surface in the valleys to 30 feet below under the terraces.

Throughout the basin, particularly in the Laramie River valley, the water in the alluvium moves parallel with the course of the streams. The water moves slowly due to the nature of these deposits and is the source of supply for a number of lakes nearby.

Conditions are favorable for artesian wells in the Laramie Basin owing to its geologic structure and moderate quantities of artesian water are found in the Casper, Satanka, Sundance and Cloverly formations, also the Shannon sandstone.

A similar investigation made in the area of the Paintrock Irrigation Project in north-central Wyoming indicates that there is

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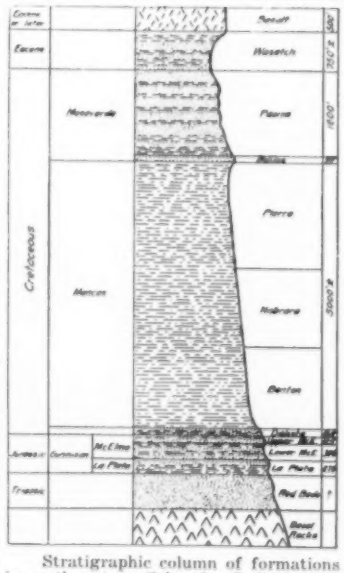

Stratigraphic column of formations in southwestern Colorado (Bulletin 28).

GROUND WATER PROVINCES OF THE UNITED STATES

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ground water available in limited quantities. The ground water conditions in general are the same as those in the Laramie Basin, except for local differences in geology and terrain. The alluvium in this area carries considerable water, so much so that there are places along the low lying irrigated lands that are water logged.

The terrace deposits along the streams sometimes rise as much as 125 feet above the stream beds. While they are made up of pervious materials, mostly sand and gravel, their source of water is mostly from surface irrigation unless the deposits extend downward as low as the alluvial deposits and can be recharged from stream flow. For this reason wells in the terrace deposits may furnish sufficient water for domestic supplies, if adequately recharged. Wells drilled near the upper margins of the terraces may hit bedrock above the lowest level of the water table. Such wells usually go dry at certain periods of the year. Deeper drilling is of no particular benefit as the underlying formations are very likely to be impervious.

Tertiary sand and gravel capped by their lava flow. South of St. Johns, Arizona (W. S. P. 836-B).

Exposure of black Mancos shale in southwestern Colorado (Bulletin 28).

Going to the lower rock formations offers some possibilities. The Fort Union sandstones and shales yield small quantities of highly mineralized water. The Lance formation of upper Cretaceous age also has possibilities, as has the Meeteetse sandstone and shale. The Cody shale is not reliable nor is the Frontier formation of gray sandstone. The Mowry shale is also exposed in the area but it holds little usable water. Still further down are the Thermopolis and Cloverly formations, though neither of them are considered good aquifers. The Morrison formation has possibilities when recharge is adequate, though the sand is fine. The conglomerate beds seem to hold the most water in this formation. Though there are other permeable formations in the area, none of them are considered good water producers. The area is not noted for large supplies of ground water though most ranchers are able to secure some kind of a ground water supply if they have patience and go deep enough.

Province Q extends northwesterly through the central part of Montana almost to the Canadian border. The conditions at Great Falls are typical of this area. Here the Missouri River valley is filled with glacial material. Along both the Sun and the Missouri Rivers these deposits reach a thickness of several hundred feet. Being composed of silt, sand, and gravel, these deposits are the source of large supplies of good water. Even the alluvial deposits in the flood plains of the river are a source of water to shallow wells.

Below the valley fill and making up the steep banks of the Missouri River there are several sandstone and shale formations. Great Falls is underlain by the Kootenai formation; below this formation within the city limits and at depths from 200 to 400 feet is the Sunburst sandstone, a very large supplier of water. Six miles south of Great Falls this formation is at the surface and is supplied with water by the flow of Sand Coulee and Box Elder creeks. Below the Sunburst occurs first the Ellis limestone, then the Quadrant sandstone usually present above the Madison limestone. The later formation is of Paleozoic age and not a source of water. Southwest of Great Falls the Sun River bench is underlain by an extensive sandstone ledge which is near the top of the Kootenai formation. This sandstone about 50 feet thick is porous and is an excellent water producer. Many wells penetrate it and it invariably yields large supplies of good quality, which the conditions at Great Falls cannot be duplicated everywhere in that portion of Province Q lying in Montana; the area has sufficient ground water for many towns and villages and the vast majority of ranch and stock water wells.

At Lewiston, Montana, which lies in the eastern portion of the Judith Basin, there is a heavy blanket of sand and gravel outwash, mostly from the mountains to the south. The upland west of Lewiston has

(Continued on Page 5)

(Continued from Page 4)

many wells securing good supplies from the lower portions of this gravel deposit. The bed rock below the northwestern part of Lewiston is Colorado shale while the bed rock in the southeast part is the Kootenai formation. Here the formations take up their regular sequence of Morrison, then Ellis, both of which contain sandstone beds containing water. Below the Ellis in this area the Quadrant, several hundred feet thick, is the best source of supply in this part of Montana. Wells sunk near Hanover, eight miles west of Lewiston, encountered a flow estimated to be 50,000 barrels per day from the Quadrant and at Big Springs six miles south water rises by artesian pressure from this formation.

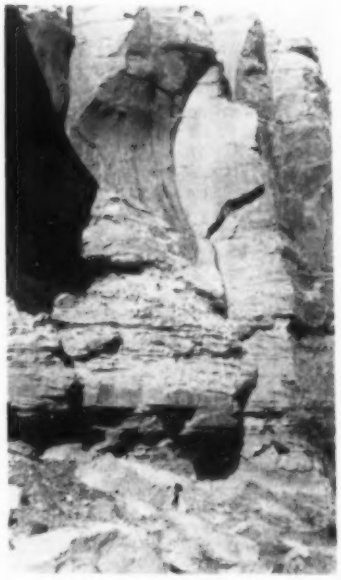
Province R is a relatively cold region, chiefly mountainous but with intermontane valleys and plains. It covers the western portion of Montana, the northern half of Idaho, and a narrow strip along the western line of Wyoming. It also includes a small area in the central-north part of Utah.

The whole area is underlain by a great variety of rock formations. As in other mountain regions, water supplies are obtained mostly from mountain streams and springs. In places there is considerable ground water available in the alluvial sands and gravel in the valley fills and the outwash deposits of glaciers. Some wells have been developed in the rock formations, and sedimentary beds of Tertiary age, but they are few and far between.

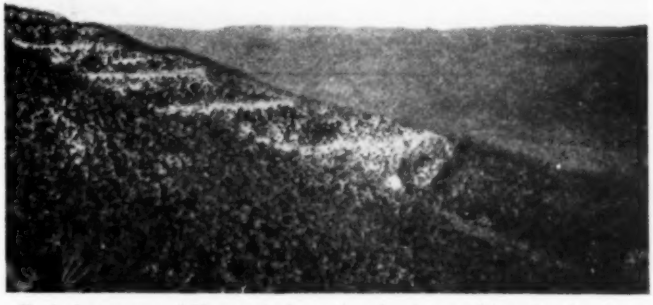
In Montana the ground water situation of the Helena Valley is typical of the area. Here is a valley practically surrounded by mountains but drained by several small streams which flow into Lake Helena. The geology of the area is complicated but can be identified with reasonable accuracy; however, it is subject to earthquakes. The older sedimentary rocks have been intruded by sedimentary rocks and therefore some of the rock formations are capable of containing ground water.

Few wells have been drilled into the older rocks but there are quite a few wells in the Tertiary "lake beds" which underlie the entire valley. The surface deposits are mostly Quaternary and are hard to tell from the older Tertiary on account of the similarity of materials. The valley depends on local rainfall and water from the melting snow. There is some evidence that considerable water is supplied by irrigation water. While the area will supply large amounts of ground water, the supply is limited and cannot be developed much beyond its present use. Furthermore, this valley is typical of many western valleys in that it is partially water logged now from water used to irrigate and if more water is brought into the valley, it will only make the water table higher and thus water log more land. Water logged lands can only be made productive again by lowering the water table to a depth below the surface greater than the height of the capillary rise and maintaining it there for the greater part of each year. To do this with low capacity wells requires a heavy expenditure for wells and power which is seldom warranted for the raising of ordinary farm crops. A better solution is to regulate the use of irrigation water and require all main ditches to be water tight.

In Utah there are many places where ground water is available. One of the best known is the Jordan Valley near Salt Lake City. This is a rock bottomed valley filled with silt, clay, sand, and gravel, in places as much as 2,000 feet thick. The most permeable formations are found near the foot of the Wasatch mountains in an area known as the Provo and Barneville benches. Due to the intermingling of the clay beds with sand-gravel beds, artesian conditions are found in places. On the benches themselves the water table is low, but in the lower areas of the valley along the Jordan River and west of Salt Lake City as far as the Great Salt Lake, artesian conditions exist and many flowing wells have been drilled.



Massive Upper Cretaceous sandstone overlying a shaly sandstone east of Cedro Spring, Arizona (W. S. P. 836-B).



Typical exposure of Mesaverde formation showing sandstone benches in southwestern Colorado (Bulletin 28).

ARTIFICIAL RAIN MAKING

Since the beginning of Time man's welfare and progress have to a large extent been determined by rainfall. In places there has been too much, in others just enough, and in other places there was not enough.

All of us are familiar with the professional rain makers of the past who practiced their arts on many a parched area with more or less success, mostly less. People have suffered untold hardships on account of the lack of rain and by the same token have been heavily damaged time and again, all on account of rain.

Today we are hearing more and more about artificial rain making on a scientific basis. This new method of rain making is of particular interest in the arid and semi-arid parts of our country. It has been tried in many places with considerable success, and many wonder just how it is done and what the facts are.

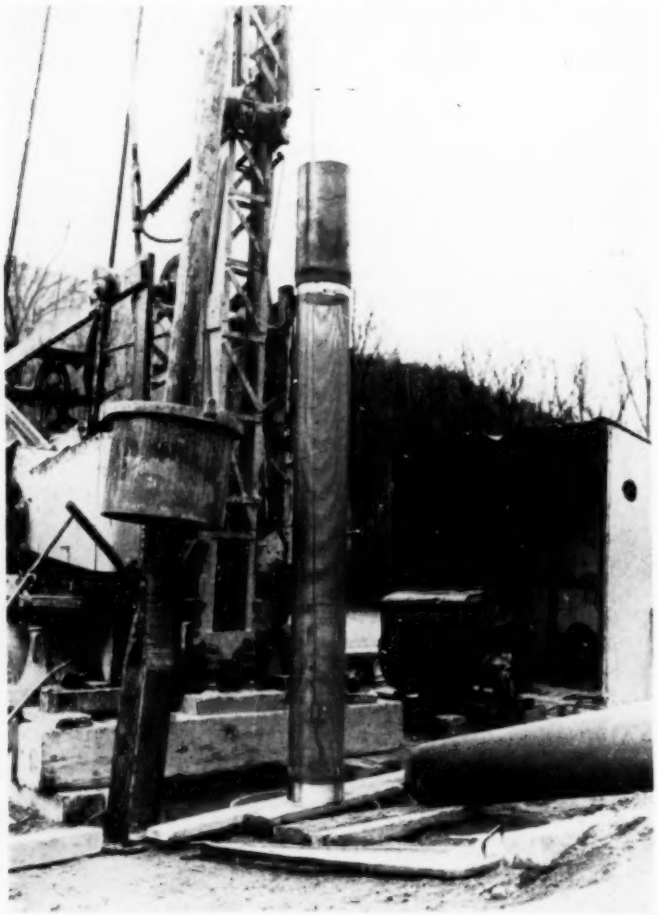
It all started some years ago at General Electric Company, Schenectady, New York. One of their scientists by the name of Schaeffer began making some experiments which proved that it was possible to induce or rather produce rain from certain types of clouds under certain conditions. Further experimental work in New Mexico seemed to bear out Schaeffer's theories. As a result, we now have many rain making companies who are willing to enter into contracts to produce rain in given quantities on selected areas, etc.

Most of these rain makers introduce silver iodide in vapor form into the atmosphere with the intention of creating rain which will fall on the desired area. This involves a detail study of the cloud formations, the direction of the wind and the amount of moisture in the clouds. The idea is that the silver iodide vapor disperses both vertically and horizontally in a large volume of air which already contains considerable water and needs something like this to touch it off. A good deal of the success of artificial rain making depends on the amount of silver iodide used and the timing. If too much is used, the natural rain cloud may be destroyed entirely or the seeding may produce more rain than wanted.

Another method of inducing rain is by the use of dry ice (CO_2) dropped from an airplane. This method is older than the silver iodide method and has produced some spectacular results as well as dismal failures. In 1948 and 1949 Dr. Krick of Pasadena, California, was able to produce 6,000 to 12,000 acre feet of water in one operation. This was done by one plane dropping 150 to 300 pounds of dry ice above the cloud and another plane dispersing vapor silver iodide below the cloud.

In connection with artificial rain making several legal questions have developed which may have an important bearing on the future use of any method of artificial rain making. The legal questions involve any damage that may be done on account of too much rainfall or questions having to do with who owns the water in the clouds in the first place. Furthermore, there is always the question of how much of the rainfall is natural and how much is artificial.

At the present time several of our western states are seriously considering legislation to regulate artificial rainfall.



The Twin State Well Company in Vermont build all kinds of water for many different purposes. One of their recent installations was a well built for the Rochester, Vermont Fire District. This 40-foot well when completed with a 12-inch Everdur screen 8-feet long produced over 300 g.p.m.

OUR WATER RESOURCES

Water is our most important resource. Most everyone recognizes this. If they do not, they should try living one day without it. Think for just one moment what you would do if our rivers and lakes dried up and that there was no more water left in the ground. Only nature could cause such a catastrophe, but man can do a lot to contribute to such a condition.

Many people and some of our states are becoming aware of this fact and are doing something about it. Just recently the State of Indiana Department of Conservation published a small pamphlet entitled, "Save Indiana's Waters." Anyone interested in this subject would profit by obtaining a copy for themselves.

In reading this book, we think some of the points brought out in order to prevent the waste of water are worth repeating. For instance, water is wasted in many ways. In some states artesian wells are allowed to flow without regard to the rights of others. Such wells secure their water from underground reservoirs furnishing other wells, such as domestic, industrial or municipal wells. There may be enough water in the reservoir to supply everyone, but there is no reason why anyone should be allowed to waste it.

Take the matter of drainage ditches. Much water is carried to our streams and rivers through ditches. They are essential in order to drain the land properly, but in times of drought this water should be saved. By the same token, ditches in times of flood may relieve one area of surplus water only to transfer it to another area down stream, thereby making the flood conditions worse.

Water is too valuable to waste at any time. In spite of this, millions of gallons of water from wells are wasted every year in air conditioning, as the water after being used is too warm for re-use without cooling.

Streams are polluted by using them as open sewers. Many industries use them to dispose of their wastes. Floods waste water as well as property and human life. This was demonstrated recently in Kansas and Missouri. The sad part of it is that such floods can be prevented and water saved by proper control measures.

Winona, Minnesota has over 22,000 population and obtains all of its water from several large capacity wells. The most recent addition to this city's well supply was a 20-inch well with an Everdur screen which produced over 1,500 g.p.m. on test. The drilling contractor was the Thein Well Company of Clara City, Minnesota.

In many states nothing is done to conserve and maintain lakes in their natural state and at their natural level. As a result many lakes which show on our early maps are now dry or filled with sediment. In Minnesota lake levels are gradually being established and controlled by the Department of Conservation. At the same time such things as contour plowing to prevent erosion of top soils and conservation of water are being practiced.

The job of saving water which is another way of defining conservation is one that should interest everyone and have their fullest co-operation whenever plans are being made to conserve water. By acting now before it is too late, our water resources can be conserved and protected for all time, our recreation areas be preserved, our water supply for the future maintained, and our industries expanded with the assurance of adequate water.

Indiana has more than 600 natural lakes, the value of which is beyond estimation. Furnishing recreation for millions of people, they provide occupations for many more, they add to the state's wealth in increased taxes from the businesses dependent on them. This same situation prevails throughout the states of Wisconsin, Michigan, and Minnesota, who have even more lakes. Equally important is the fact that these lakes when maintained are at the same time conserving water.

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M. West, President ..... Salem, Oregon
Frank Gaut, Secretary ..... Beaverton, Oregon

Ohio
L. P. Cranz, President ..... Ira
E. D. Allen, Sec'y-Treas. ..... Steubenville

Oklahoma
R. D. Sawyer, President ..... Chickasha
L. J. Clarke ..... Oklahoma City

Oregon
Ed Steinman, President ..... Portland
Art Grant, Secretary ..... Aloha

Pennsylvania
EASTERN DIVISION
John H. Rulon, President ..... Philadelphia
Thomas Magee, Secretary ..... Philadelphia 25
WESTERN DIVISION
G. W. Walters, President ..... Rimersburg
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D. O. Hamilton, President ..... Portsmouth
D. E. Whelan, Secretary ..... Providence

South Dakota
Roy Magnus, President ..... Webster
Harold Norbeck, Secretary ..... Redfield

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W. C. Falwell, President ..... Lynchburg
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O. E. Erdman, Sec'y-Treas. ..... Elma

Wisconsin
George Galloway, President ..... Milwaukee
Ralph H. Nienow, Executive Secretary ..... Merrill

TOM'S COLUMN

Dear Fellows:

Well you know there's a lot of things happen in a man's life most of which he aint got much call to remember, but every once in a while in the course of events something will pop that leaves a memory that never dies down. When the boy headed to the induction center for world war 2 the Missus an' me went along as far as we could to see him off. The years he was sloggin' thru jungles an' carryin' guns for his country it took a lot out of us just waitin' and hopin'. It was a great day in our lives when he come back and we figgered there wouldn't be no more nonsense about havin' to put down dictators, mean eyed Fascists and such. Well, Uncle Sam seems to be havin' considerable

trouble tryin' to get along with the boys he thought was his buddies in the last fracas, so once again they're soundin' the bugles fer able bodied young fellows to get goin'. We just got back from seein' the boy off again. Me and Ma are back now tryin' to put on a good front. I suppose there aint anybody who can call the turn on what's likely to come out of this jangle of argument an' racin' fer bigger armaments, but we hate to have to face up to goin' through that anxious waitin' again. The boy tho, he just takes it in stride. Sort of looks at it as a job to be done an' let's get at it an' do it. I'll miss the boy a good deal even if he was in the habit of tellin' me how to run the business.

Comin' back home we stopped at a place fer the night and I got to talkin' with a man at the dinner table who gave us a yarn about an experience he had that was worth a laugh for Ma and me. Seems he had a long drive to make over a stretch of country where the towns were pretty far apart. He got started early in the mornin' and was tailin' along fer a few hours when there was a guy on foot up ahead flaggin' him to stop. His first impulse was to give 'er the gun an' pass him up, an' then he got to figgerin that a driver with empty seats in the car was a heel if he didn't slow up to find out what he wanted. He says he carried an automatic in the glove compartment so he slid the gun in his side pocket before stoppin'. The fellow said he was a farm hand headin' fer a place up the road so the driver had him get in. They drove along fer a while when the driver decided to look at the time. He said he carried a gold watch in the watch pocket of his pants—but when he reached fer it, it wasnt' there. He was sure he remembered windin' the watch that morning. Tryin' to act nonchalant he asked the guy if he carried the time. The man reached fer the watch pocket of his pants an' durned if he didn't pull out a gold watch, gives him the time, and puts the watch back in his pocket. Well sir, this man says he could of swore it was his own watch, so he began gettin jittery, thought he had a pickpocket sitting right there next to him. So he got to

(Continued on Page 9)

(Continued from Page 8)

figgerin' ways of gettin rid of his passenger—so he says they'd better take a look at the tires. He told the passenger to take a look on his side, and he'd look on the other side, an' as the passenger opened the door an' started to climb out this guy follows him an' sticks the gun at him. Hold up your hands you bum he says an' I'll just take that watch—so he slides the fellow's watch into his pocket and told him to get goin'. Well the poor farm hand started leggin' it back down the road and this fellow climbs back in the car and drove like a bat out of the hot place in the other direction. When he gets back home that night he told his wife how he handled this roughneck who stole his watch. He couldn't understand why the wife was takin' it all as a joke—till she quietly handed him his watch which he had left on the dresser when he started out that mornin.

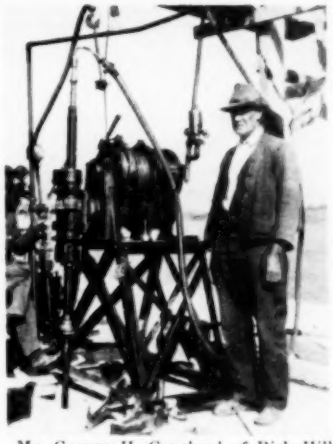
The other day the boy and me was havin' quite a discussion about gravel treatment in buildin' wells —an' when you get into that kind of argument you find that there are as many ways of gravel treatment as there are well drillers. Old Swig McGrew used to snort that a lot of us was makin' use of a high soundin' term to cover up what we didn't know about what we was doing. I guess there's a lot in what the old cuss was sayin' because most of us ordinary drillers don't know very much about how to get the best results when monkeying with an operation that calls fer a lot of technical understandin'. Some drillers talk about it because it sounds kind of glamorous to impress the customer, yet there are a lot of cases on record where gravel treatment was so unnecessary as to cause failure. Before gettin' into this gravel treatment a driller should see to it that he first goes to the places where proper information is available to him, regardin' the formation, sand and gravel analysis, an' all the elements that should be studied before gettin' messed up in it. Ask yourself a simple question like this—Can the maximum amount of water be developed from the formation **without** gravel treatment? In order to answer that, you simply gotta have proper analysis made, an' if you don't you got no business throwin in a treatment just because it sounds good. The fact is that gravel treatment of itself produces no water—the only cases where its justified at all is where water can't be obtained in any other way. I don't need to tell you there's times when such treatments are necessary, but if you're wise you'll go the limit in checkin' with the best sources of information you can get before spoutin' off too much about it.

All a driller needs to remember is that a well is drilled fer the primary purpose of developin' the maximum amount of water, sand free, an' with the least draw down. To get that — analysis of formations is all important. If gravel treatment becomes necessary—do it with the advice an' counsel of good reliable sources of informa tion.

Well, there's work to be done around the old shack so I'll be shovin' on. Good luck to all of you.

Yours truly,

TOM.



Mr. George H. Copeland of Rich Hill, Missouri is one of the few drilling contractors familiar with core drilling and setting diamond bits. Some years ago he supervised a drilling job at the Marathon Dam near Athens, Greece. The job consisted of drilling holes 100 feet below the dam and 5 feet apart. The drill holes were then filled with cement grout containing Uranium Oxide which effectively stopped the leaks in the formation below the dam.

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DRILLERS ATTENTION

There has been a change in the operation of CMP (Controlled Materials Plan) since the last article on priority ratings was published in the last issue of the Journal. This change affects the pipe situation primarily.

The self-allotment scheme described in the last issue of the Journal remains the same. SELF-ALLOTMENTS SHOULD BE USED TO THE MAXIMUM EXTENT IN GETTING MATERIALS ON JOBS WHERE THEY APPLY.

If you expect to use a fairly large quantity of pipe or some of the hard-to-get large sizes of pipe during the Fourth Quarter, 1951, or the First Quarter, 1952, you should file your requests for an allotment for either of these quarters now. To do this, you must fill out form CMP-4-C and mail it to the Water Resources Division of the National Production Authority. Your nearest NPA regional office can supply the CMP-4-C forms.

WE CANNOT STRESS TOO MUCH THE IMPORTANCE OF DOING THIS RIGHT AWAY.

It is no longer possible to request allotments by letter or telegram — THE OFFICIAL FORM MUST BE USED.

The quantities requested should represent your expected use during each quarter. Any allotments granted may be used to get material for specific job or to replace material taken out of your inventory.

After doing a fine job of getting the Water Resources Division of NPA organized, Mr. Harvey Howe is stepping out and Mr. G. Arnold of the San Diego, California Water Department has just taken over as its new Director. Mr. Arnold knows the drillers language, having served as Engineer for a good size drilling contractor some years ago. Mr. James Crenshaw continues as Deputy to Mr. Arnold. Mr. Clyde Harvill continues as Head of the Branch handling materials allocations. Mr. Harvill is thoroughly conversant with drillers' problems and with the importance of ground water development.

The American Steel Warehouse Association has released some figures that may mean a tighter pipe situation. They estimate warehouse and jobbers will probably get 23% less steel in the Fourth Quarter, 1951, than in previous quarters this year.

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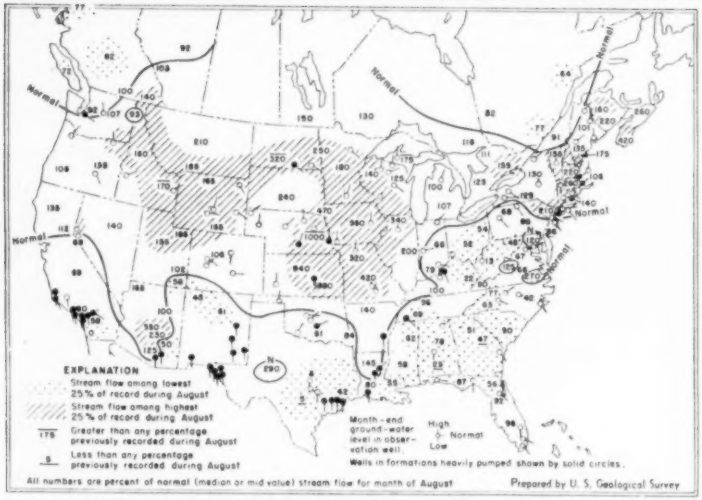
SURFACE and GROUND WATER CONDITIONS


Normal
EXPLANATION
Stream flow among lowest 25% of record during August
Stream flow among highest 25% of record during August
Greater than any percentage previously recorded during August
Less than any percentage previously recorded during August
Month-end ground-water level in observation well
High
Normal
Low
Wells in formations heavily pumped shown by solid circles.
All numbers are percent of normal (median or mid value) stream flow for month of August
Prepared by U. S. Geological Survey

STREAM FLOW AND GROUND WATER IN RELATION TO NORMAL, AUGUST 1951

The story for July is mostly one of floods and droughts. According to Water Resources Review published by the U. S. Geological Survey, the flood in Kansas and Missouri Rivers was the greatest in more than a century. The Smoky Hill and Osage Rivers were important contributors. The peak discharge of the Neosho River at Parsons, Kansas, was exceptional considering the size of the drainage basin. Local floods occurred in the states bordering the western end of the Great Lakes, and runoff was excessive throughout most of the United States. In the Southwest the drought continued with a serious drought developing in Texas. Runoff continued deficient in the Southeast.

The floods in Kansas were caused by heavy rains July 10 to 13 that followed a month of heavy rainfall. The rivers were generally reported to be covering their valleys from "bluff to bluff." The damage was enormous being estimated from $750,000,000 to $1,000,000,000 or more with over 180,000 persons either driven from their homes or stranded by high water.

In Nebraska no destructive floods were reported, but runoff was excessive throughout the state. In southeastern Nebraska swollen streams in the Big Nemaha Basin caused several breaks in the Falls City pipe line which carries ground water from the well field situated on the Missouri River flood plain near Rulo. Ground water levels across the northern half of the state were considerably above normal with the July high exceeded in an observation well at Ewing.

In Iowa some of the rivers reached high stage as did the Mississippi River. At Kansas City the Missouri River flood was the most devastating known. At St. Louis the flood in the Mississippi River exceeded the floods of 1943, 1944, 1945 and 1947. Damage also occurred on small streams throughout much of the state. Ground water levels were above normal throughout the state.

Stream flow was above normal in the Arkansas River and in the southwest part of Arkansas, and in Oklahoma several streams were in flood. Ground water levels were generally above normal.

In the Great Lakes states, flash floods occurred in southeast Minnesota following heavy rain. Runoff in the northern part of the state was below average. In Wisconsin there was a flood in the lower Kickapoo River which caused considerable damage. Ground water levels in Wisconsin were generally above normal with a new record high at Eagle River.

In Illinois record breaking floods occurred in the Vermillion and Mackinaw River basins causing considerable damage. Ground water at Princeton was nearly 5 feet higher than the previous maximum July level. Local floods in northwestern Indiana, following heavy rains at Goshen, were higher than the floods of 1950. In Michigan ground water levels in the Menominee River basin rose to new highs and a key well in Iron County reached a new high.

In the Northeast runoff was mostly normal to excessive in New York with New York City's reservoirs 86% full in mid-July. Only 6.8 million gallons per day were being pumped from Long Island ground water supplies compared to 54 million gallons per day a year ago.

Along the Atlantic Coast runoff was above normal in the northern part of Virginia, deficient in South Carolina and increasing in the Everglades region of Florida. In a key well in an unpumped area south of Louisville, Kentucky, a new high ground water level was observed for July, thus continuing the trend that has persisted since January, 1950. The drought in southern Alabama continued with considerable crop damage. Ground water levels were below normal at Clanton in the central part of the state.

Drought conditions in central Texas were worse than any previously experienced. There was not sufficient runoff in the lower Brazos or the lower Neches Basin for irrigation. Ground water levels continued to decline in the heavily pumped Houston and El Paso areas with new lows observed in all key wells, except one. Ground water levels were also below normal in Travis County. The drought in the Southwest continued with little change with ground water levels in many key observation wells at new all-time lows.

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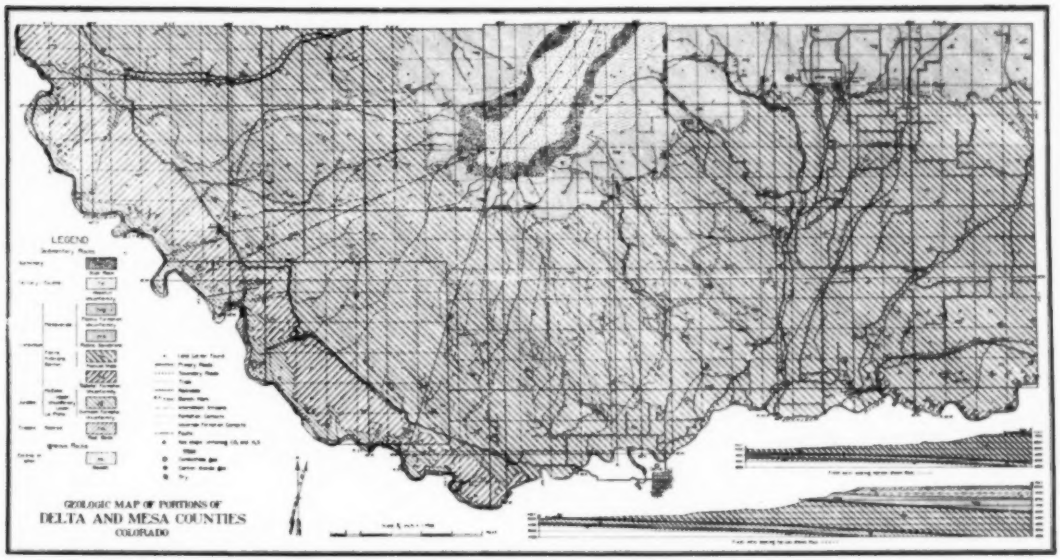
"I hear Alice is engaged to an X-ray specialist."

"I wonder what he sees in her?"



ASSOCIATION NEWS

This section is devoted to the exclusive use of water well drillers' associations, both state and local. Notices, announcements, changes of officers and other items should be sent to The Editor, Johnson National Drillers' Journal, 2304 Long Ave., St. Paul, Minnesota.

VIRGINIA MEETING

The annual meeting of the Virginia Water Well Drillers Association is to be held at the William Byrd Hotel in Richmond, October 5 and 6. All drillers in the state are welcome. A good program and entertainment has been arranged for this meeting. Better go. Jack Sundquist, Norfolk, is Secretary and can supply details.

KANSAS MEETING

The 4th annual convention of the Kansas Association will be held at the Broadview Hotel in Wichita, October 4, 5, and 6, under the guidance of L. H. Martin, President.

A partial list of speakers includes Dr. H. E. Myers, Department of Agronomy, Kansas State College; Mr. E. K. Nixon, Kansas Industrial Development Commission; Mr. Joseph Gyulay, Jr., of Wallace and Tiernan Company; Mr. S. W. Lohman of the U. S. Geological Survey; Mr. Richard E. Hanson, Agricultural Engineer, Mr. Bill Wallace of the Oklahoma Drillers Association, and E. P. Murphy, Gen. Mgr., Thatchers, Inc., Topeka.

In addition to the program, the usual business sessions will be held and entertainment provided to make the meeting more enjoyable. Those wishing to exhibit their equipment or products will find space available. Mr. A. R. Leonard, Service Secretary, c-o University of Kansas, Lawrence, is in charge of arrangements. A stag party will be held on Thursday, October 4th.

EMPIRE STATE MEETING

A regular quarterly meeting of this association is being arranged for October 3. It will be held at the Mark Twain Hotel in Elmira and be followed by an evening banquet and entertainment. Robert E. Klindt of Morris, New York, is Secretary.

OKLAHOMA MEETING

The 3rd annual convention of the Oklahoma Association has been set for November 8 and 9 at the Extension Study Center, North Campus, University of Oklahoma, Norman.

The principal feature of the meeting will be a display of water well equipment and demonstration by manufacturers. Plenty of room is available both inside and out for all those who wish to exhibit their products.

Definite hours will be set aside for the demonstration of exhibits or equipment. During these hours there will be no speakers to detract from inspection of displays. There is no charge for exhibitors' space.

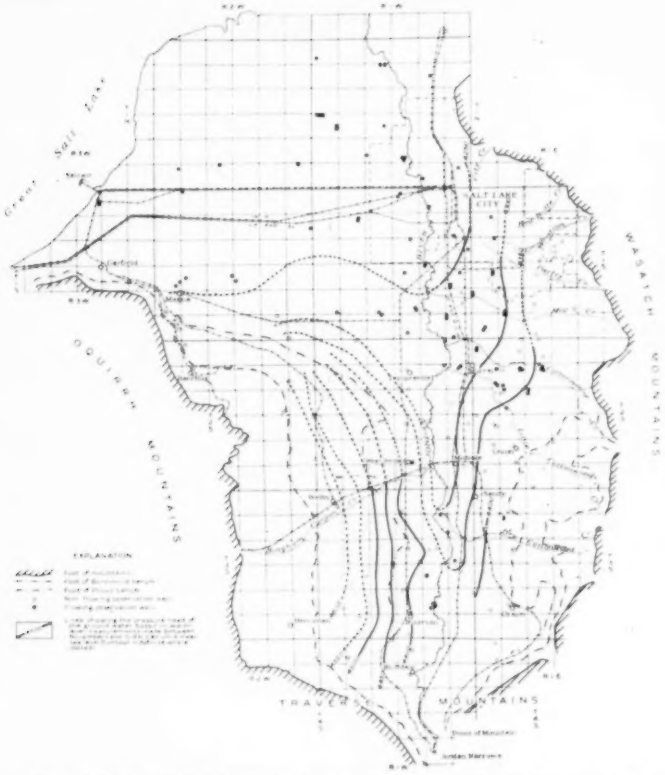
In addition there will be a program of speakers and opportunity for everyone to get acquainted. Write to Mr. L. J. Clarke, Secretary, c-o State Department of Health, Oklahoma City, for details about the meeting, evening banquet, and entertainment that has been provided.

OHIO MEETING

A regular meeting of this group was held at the plant of The Deming Company in Salem, Ohio, Saturday, September 8. On the program was a tour of the plant followed by lunch provided by the company. A goodly number of drillers turned out to take advantage of The Deming Company's hospitality.

MONTANA MEETING

At the recent meeting of the Montana Association held in Lewiston, the following officers were elected to serve the present year:
President—A. Russell Mowbray, Missoula.



Map of Jordan Valley in Utah showing the pressure head of ground water in November, 1931 (U. S. G. S.)

Vice-President—K. D. Thompson, Wibaux.
Secretary-Treasurer—B. M. Whitmer, Circle.

We are glad to have this report from Mr. Andy Anderson of Billings, Past Secretary.

PENNSYLVANIA MEETING (Eastern Section)

A regular meeting of this section was held at the Redington Hotel in Wilkes-Barre on June 9 with the President, Mr. Harold Rulon, presiding, following a luncheon sponsored by the Keystone Driller Company. Over 50 members and guests were present.

Following a business meeting the group adjourned to another room in the hotel where the Program Committee in charge of Bob Starr presented an interesting program. The next meeting was a joint meeting with the Western Section at the Penn Harris Hotel in Harrisburg, August 11, 1951.

SAN JOAQUIN VALLEY ASSOCIATION (California)

This group publishes a bulletin or circular letter to its members which keeps them up-to-date on legislation and government regulations. Out of 227 drillers operating in the valley 122 were members of the association as of January 31, 1951. Glen V. Slater, Fresno, is Secretary-Manager of this association.

MISSISSIPPI MEETING

The annual meeting of the Mississippi Association was held July 21 and 22 at Jackson and was attended by drillers and other interested people from all over the state.

The meeting was presided over by W. K. Journey, Vice-President, in the absence of J. Leon Pringle, President.

During the meeting Dr. M. P. Etheredge, State Chemist, addressed the group on Potable and Industrial Waters. At the annual banquet Dr. W. C. Morse, State Geologist, spoke on the Geology of Mississippi.

At the business session the following officers were elected to serve the 1951-52 term:

W. Kenneth Journey, Greenwood, President; C. T. Switzer, Gulfport, Vice-President; Fred Sutter, Pass Christian, Secretary-Treasurer.

NEW ENGLAND MEETING

A meeting of the New England Association was held in Worcester, Massachusetts, at the Sheraton Hotel, on June 8.

Mr. R. E. Chapman of Oakdale, Massachusetts, was appointed to draw up a code of ethics for the drillers. A number of interested people were present for the meeting and Mr. Snyder of the Massachusetts Registry of Motor Vehicles gave an interesting talk on registration rates for drilling equipment.

NORTH DAKOTA MEETING

Mr. Fred V. Sletvold of Oakes, Secretary of this association, has advised us that the annual convention of this group will be held in the War Memorial Building at Bismarck on December 3 and 4, 1951. More details will be available later.

IDAHO MEETING

Through the grapevine we learn that this association held its 4th annual meeting at Burley, Idaho, June 11 and 12, at which time Jim Schoonover was elected President; Francis Veach, First Vice-President; Jack Dir, Second Vice-President; and W. B. Bowler, Secretary-Treasurer.

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DRILLERS ATTENTION

(Continued from Page 9)

This will hit structural steel hardest, but will probably affect pipe shipments to jobbers. This only emphasizes the importance for drillers to learn how to get CMP allotments both by the self-allotment system and by formal application using form CMP-4-C.

ADVERTISEMENTS

We will insert advertisements for drilling equipment wanted or for sale, help or work wanted, etc., for our readers, free of charge. Advertisements must be brief, and we cannot assume responsibility for them, but will be glad to put parties in touch with each other by this means and suggest that they investigate any offers or inquiries carefully for themselves.

FOR SALE: Keystone 70 with International Diesel UD6 power unit, mounted on 10-wheel Mack; Keystone 1½ made in 1938, mounted on Auto Car, all clutch model; both rigs with or without tools. All engines recently overhauled. Priced for quick sale. Write 4218 Herkimer Place, Bronx 66, New York.

FOR SALE: No. 25 wood frame Armstrong heavy rig-a Frame derrick, with Bucyrus, shocks in derrick, new 6-ft. bandwheel and new asbestos lined brake wheel, mounted on wide hard rubber, dual rear for towing back of truck, no engine ready for one with roller bearing jack shaft on back of machine, cash f.o.b., Delafield, Wisconsin, $700.00; also portable heavy duty rotary on White truck, completely equipped with mud mixer, small tools only, trailer, etc., ready to go; photographs on request. Write Gray Well Drilling Company, Box 181, Delafield, Wisconsin, or telephone 1051.

HELP WANTED: Drillers, cable tool, modern machines, within radius of 50 miles of Milwaukee, formations are gravel-sand and rock drilling since 1861; good opportunity for sober, industrious men, who know drilling and are careful; also wanted an experienced helper and for pump installation and repair work; salary and bonus or straight footage; contact the Gray Well Drilling Company, Box 181, Delafield, Wisconsin, or telephone 1051.

The Varner Well Company of Dubuque, Iowa drilling a well for the City of Peru, Illinois under the supervision of Mr. Ernest D. Middaugh of the Francis Engineering Company. The 12-inch well when finished was approximately 2,676 feet deep and was estimated to have a capacity of 1,000 g.p.m.

William C. Selmer & Sons cover the territory around Madison, Wisconsin. The picture shows a well being put down for Mr. Earl Eisele of McFarland, Wisconsin. It is 84 feet deep with water at 10 feet and produced over 800 g.p.h.

FOR SALE: Bucyrus-Erie 22-W drill mounted on 1944 Chevrolet 4x4 with tools for 6-inch holes and cables ready to go; this machine has casing reel, spooling device, tool guide and blower; bought new in 1949 and has been used about one year; price $4,950.00. Write: G. A. Linn, Morganton, Arkansas.

FOR SALE: Dodge 1½-ton L.W.B. four-wheel drive truck; also army surplus repairs for Star 71 machine and Continental 162 motor. Write: J. B. Reed, Box 38, Fredericktown, Ohio.

FOR SALE: One No. 42 Cyclone mounted on 6-wheel drive Army truck; machine has drilled less than 2,000 ft. of 4-inch and 5-inch holes; truck is in excellent condition with 11 like new 8:25:20 tires and runs perfectly; machine has telescoping 36-ft. mast with power hoist; 800 ft. ⅝-in. drill line and ⅜-in. sand line; 600 ft. never off the drum; engine, Red Seal, like new; some tools available with rig for 4-in. and 5-in. holes; price $4,500.00. Located in northeastern Illinois. Write: C. L. Wertz, Antioch, Illinois, telephone 403-J.

FOR SALE: 2,000 feet new 6-in.—1945 lb. L. W. Steel drive pipe with drive pipe couplings, half random lengths, subject to prior sale. Write: McEwen Bros., Wellsville, New York.

FOR SALE: Water well drilling machine for 5⅝-in. and 6-in. wells, cheap, with or without tools. Write: Walter Schuldt, Sodus, New York, telephone 7015.

FOR SALE: No. 1½ Clipper steam tractor 600-ft. machine; tools, welding beam and temper; 16-ft. stem; 4-in. jars and 2-in. bits for 5⅝-in. holes; derrick 32 ft. Priced reasonable. Write: O. F. Stewart, Clayton, Indiana.

FOR SALE: New Johnson 500 portable pump; tool kit contains extra parts, three 12-ft. intake hose 3½-in., 50 ft. outlet hose; intake coupling for 4-in. and 3-in. intake. Ideal for irrigation or heavy duty water jet, 500 g.p.m. at 100 pounds pressure or 750 at 35 pounds. Reasonable. Write: D. E. Hargreaves, Box 217, Perryville, Maryland.

FOR SALE: Small all-steel well drill for small size holes; drill mounted 1946 ton and one-half Ford, located in northeastern Ohio. Write: Abe Fasnacht, 108 Hazlett Ave. N.W., Canton, Ohio.

FOR SALE: Well drilling business, 2 machines and equipment to drill 5 to 12-in. wells; 45 x 100-ft. machine shop and warehouse; good territory and doing good business; must sell due to poor health. Write: F. E. Mead Well Drilling Company, 1214-11th Ave., North, St. Cloud, Minn.

FOR SALE: 48 Model 22-W Bucyrus-Erie machine complete with all tools for 3, 4, and 5-in. work; mounted on 35 Model Ford truck; price complete $3,500.00 old age reason for selling; any amount of work in territory if desired. Write: Oscar Nygard, Meadowlands, Minnesota.

FOR SALE: Water well drilling business. No competition. Plenty of new pipe, 1951 equipment; business established in several counties. Also new No. 42-1951 Cyclone drill, never been used; mounted on late model International truck; casing reel, starter and generator; fully equipped. Write: R. R. Long, R.R. No. 6, Jacksonville, Illinois, phone 512.

(Continued on Page 14)

Mr. T. Beagrie of Swalwell, Alberta, drilling an 8-inch well 425 feet deep for the Hotel Carbon at Carbon, Alberta. The rig is a No. 5 Keystone. The well was a "duster."

(Continued from Page 13)

FOR SALE: Rebuilt Keystone drilling machine, semi-trailer, mounted with 1½-ton truck; tools from 10-in. to 6-in.; machine good for 1,000-ft. drilling; located in Washington County, Oklahoma. Working on well. Best offer takes it. Write: Milaeger Well Drilling Company, 4630 West Burleigh Street, Milwaukee 10, Wisconsin.

FOR SALE: One Failing 1,500 Holemaster Rotary machine mounted on Ford V-8; new truck motor; machine in A-1 condition; 27' mast with 10' extension; will sell with or without new tools; also One All steel cable tool machine, truck mounted; 36' mast with Bucyrus-Erie shock absorber; equipped with jetting pump and new Wisconsin power unit; cables but no tools. Write: Salmon Well Company, Wakefield, Nebraska or telephone 16.

FOR SALE: One Reverse Rotary Drill complete with 300 feet of 6-inch drill pipe mounted on 1946 Chevrolet Truck; Dove Pump, portable. Easy to operate; other equipment included if necessary. Write or see Ben Hasz, 108 E. First Street, Scott City, Kansas.

FOR SALE: Well drilling business in one of northeast Nebraska's best towns; clean stock and trucks, rotary drill; help available; will rent home and shop to responsible party; invoice cost price; plenty of work ahead; retiring from business. Write: S. R. Jonas, Randolph, Nebraska.

FOR SALE: One 4¼"x18' new Spang Drilling Stem and one 5¼" Spang Prosser Swivel Rope socket both with 2½"x3½" API joints 4" squares. Write or call: Buckeye Supply Co., Zanesville, Ohio.

DRILLER WANTED: For 4" and 6" work, Detroit area. Steady work. Write: H. R. Tracy, Route 1, 29200 Greening Blvd., Farmington, Mich.

FOR SALE: Howell No. 60, all steel, pneumatic tires, trailer type, shock absorber. Write: The Alton Cement Works, Alton, Iowa.

FOR SALE: Nearly new No. 502 Oster pipe threading machine, reversible motor, three die heads ⅛" to 2", cut off and pipe stand. One new B-E down cutting wire line knife with 30'x1½" stem, built in jars and eye box, cuts up to 1" wire. One Ideco 6" off set underreaming all steel bit, used on one job, pin 2⅛"x3¼" API, priced right. Write: Neil A. Crandall, 1324 Utica St., Oriskany, N. Y.

FOR SALE: One overshot fishing tool, two Darrel subs, 4 rock bits ranging from 3½" to 7"; one set Hawthorne's rock bit subs 3½"x4¼"; and two Blue Badger bits to fit end rod for rotary machines. If interested, write: E. J. Weiwoda, Buds Drilling, Killam, Alberta, Canada.

WANTED TO BUY: 22W or 20W Bucyrus-Erie rig less tools. Write giving full description and price to Alvin Rankin, Hanley, Sask., Canada.

DRILLER WANTED: Cable tool driller wanted for steady work; all year; must be a sober man who can drive pipe and drill limestone. Write: Gray Well Drilling Company, Post Box 181, Delafield, Wisconsin.

FOR SALE: Frame work and working parts of custom-built machine similar to Armstrong No. 45 Twin-disc clutches, all steel. Write: Box 117, Isle, Minnesota.

FOR SALE: One good home-made wire line spudder with two strings of tools, bits, 4-inch to 6-inch bailers, chain tongs, drive clamps, and plenty of other tools; price $750.00. Write: W. J. Beu, Box 283, Lodi, Ohio.

FOR SALE: One Dempster drilling machine B-15, 34 foot telescope mast in good running shape; one set of drilling tools 4½" by 16' drill bits 6" to 20". Write: Snyder Well Drilling Company, Bayard, Nebraska.

Well drillers often have to set up in bad places. Here Norcross Bros. of Norwich, Connecticut are lifting a 71 Speed Star bodily to the top of a 10-foot wall shown in the picture. The owner had gone without a well for 22 years as there seemed to be no way to get a drilling rig on the job. It took 40 minutes with a crane to get the rig in position to drill a 6-inch 300-foot well.

FOR SALE: Four inch bits; 1 drill stem 4½" by 14'; one set jars, wire line rope socket; also one set of tool wrenches for 4" square. All 2x3x7 API Joints. Write: Rachbauer Bros., Durham, Conn.

FOR SALE: One combination rotary and jetting, all steel drilling machine; capacity 500 ft. mounted on ½ ton Dodge truck. Price complete $1,200.00. Write: Nick Rapp, Route 2, Box 311, Summerville, South Carolina.

FOR SALE: Bucyrus-Erie 29-W drill, powered with caterpillar 4400 diesel, top condition, located at San Francisco; $7,500.00. Write: J. N. Pitcher Company, 7108 Mission Street, Daly City, Calif.

FOR SALE: Cable well drilling machine in good condition mounted on rubber wheels; drills deep wells and 2-4-6" wells. Write: Mrs. Parlin Peterson, Avon, Illinois.

DRILL FOR SALE: Failing rotary, rated 1,500' depth, mounted on Ford Truck, complete with all equipment to drill; water truck, rods, bits, etc. Good condition. Write: Lowell Rasmussen, Hettinger, North Dakota.

FOR SALE: Illness forces sale of 2 year old Ideco No. 25 drill rig, includes catheads, casing reel, line spooling device, $7,500.00 without tools, line, truck. Write: R. E. Anderson, Route 1, Box 150, Lakeside, California.

FOR SALE: 5 Bucyrus-Erie 22W drilling rigs, truck and trailer mounted, priced at $4,000.00 and up; one Howell 160 mounted on Chevrolet truck average workable condition, reasonable; one Howell 220 Special mounted on Ford truck or unmounted; new U9 International motor just put on and the rig has been used very little, 48' mast; 500' new 5⅝" galvanized casing available with the purchase of any of the above rigs. Write C. L. Jennings, New London, Iowa.

WANTED TO BUY: Late model Bucyrus-Erie 36L drilling rig. Write: C. L. Jennings, New London, Iowa.

FOR SALE: Star 32 Wood frame spudder mast 32' mounted on '35 Ford truck both machine and truck in good condition; can be bought with or without tools; also Loomis all steel Spudder new motor telescoping pipe mast 32' to 45' mounted on '38 Chevrolet truck condition of truck and machine good. Can be bought with or without tools. Write: Charles Taggart, MR 63, Box 459, Hamilton, Ohio.

FOR SALE: 1947 No. 71 Speed Star mounted on 1940 Chevrolet 1½-ton Thornton rear end Tamden drive truck; this machine newly cleaned and painted and in storage 2 years; 40' mast 47 h.p. Continental red seal motor, Dual catheads, blower mounted on rig, tool guide, complete string 6" tools; price $4,000.00; also Bucyrus-Erie 33 on 1937 Chevrolet 1½-ton truck, no tools, price $2,000.00. Sand jet pump on drill. Write: W. J. Rodgers, Gulliver, Michigan, phone 23F14 after 7, evenings.

FOR SALE: 44 Oil Field Cyclone churn drill; has only drilled 4,000 ft. since purchased new; mounted on 3-ton International truck; truck in perfect shape; good tires all around 700 ft. ¾ inch cable, 400 ft. 7/16 sand line, blower and reverse gear attachment. Price $5,700.00. Write: Kabele Brothers, 950 Siemers Street, Platteville, Wisconsin.

THE SOFTMASTER

The F. E. Myers & Bro. Company, Ashland, Ohio, is proud to announce a new automatic water softener, known as the The Softmaster. To regenerate this new unit, you simply push a button which can be located anywhere in the house. Electrical controls complete the entire regeneration cycle.

One of the outstanding features of the new Softmaster is its extreme simplicity of operation. An automatic by-pass permits water to be drawn out of any outlet during regeneration for any emergency. No salty water can ever enter the house lines. The only attention ever required is to add salt to the brine tank two or three times a year. The water level in the brine tank is accurately controlled by two feeler electrodes which prevents salt from creeping up the sides of the tank. No special connections are necessary. Simply plug into any 110 volt outlet.

The famous patented double check system has been incorporated into this new softener eliminating a gravel bed. This allows 44% more zeolite in the mineral tank providing far greater softening capacity.

Tanks are of heavy gauge steel, galvanized inside and out with two coats of gleaming white enamel added. All working parts are of copper or brass to give the largest possible life. The Softmaster is made in three sizes for use with two Zeolites. Full information is available from the factory.

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MICROMET FEEDER

Some time ago Micromet was brought out to relieve "red water" troubles. Now a new market for well drillers serving rural families and others who have their own wells is opened with the introduction of the new "Micromet Pump Feeder" for eliminating corrosion, lime scale and iron water troubles in farm and suburban water systems.

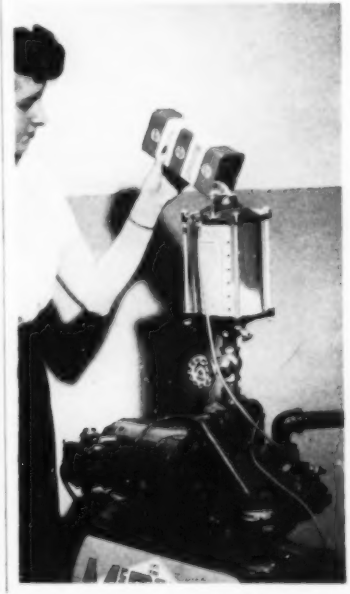
It has already won the enthusiastic approval of pump and water softener manufacturers, agricultural authorities, and dealers serving rural familes. They report that Micromet treatment brings the same kind of effective control of rust attack, lime scale, and iron water so widely used in city systems to farm and suburban water supply systems.

Although Micromet is a good grade phosphate as safe to use as table salt, it has no effect on the drinking qualities, odor or taste of the water. It protects the water system and helps maintain its full capacity as iron deposits and lime scale do not build up in a system protected with Micromet.

It puts an end to stains on plumbing fixtures and laundry, clogging of water softeners and piping and other troubles that plague water systems.

The feeder is designed to work at different pressures so that a small amount of the well water, about ¼ to ½ gallon per minute, is removed from the main flow of the pump discharge. This small amount of water is borrowed for the Micromet treatment and then returned to the pump section, rejoining the main stream of water. Actually only a few parts of Micromet are required to treat a million parts of water to proper concentration, yet this is enough to take care of the three types of trouble that commonly occur in private well water systems.

The new feeder can be used on any type of a pump except the deep well reciprocating type. Other types of feeders can even be used on these pumps. Calgon, Inc., representatives, are available for larger problems and installations, but any well driller, plumber, or equipment dealer can provide this equipment. Remember Micromet is not a water softener nor does it act as a filter to remove taste or odor. It is used only to correct corrosion, lime scale and iron water troubles. The Calgon, Inc., is located in the Hagan Building, Pittsburgh, Pennsylvania.



Friend: "Has your wife changed very much since you married her?"

Husband: "I'll say—my habits, my friends and my hours."

A Champion

The dog you see here is truly a champion. If you've ever hunted with a really *good* dog, you know that's half the fun of a hunting trip. On the other hand, if you've never had the luck to hunt with a champion, you don't know what you're missing.

Drilling wells is quite a bit like hunting—unless you've used a "champion", you don't know what quality performance is. In well screens, we think that the JOHNSON well screen is the champion of them all. It's taken us almost fifty years of constant effort to make the JOHNSON what it is today—the most nearly perfect well screen that it is possible to obtain.

Give the JOHNSON a chance to help you bring home "the limit" in customer satisfaction. You'll find that it really pays off to use the best—in dogs and well screens.

QUALITY IS REMEMBERED LONG AFTER PRICE IS FORGOTTEN

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